



PATENT
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

PARK et al.

Application No.: 09/839,594

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For: LOW DIELECTRIC
COMPOSITE WITH
NANO MAGNETIC
PARTICLES,
MANUFACTURING
METHOD THEREOF,
AND
SEMICONDUCTOR
DEVICE AND
OPTICAL DEVICE
USING THE SAME

CLAIMS PENDING AFTER PRELIMINARY AMENDMENT

1. A composite comprising:
a dielectric matrix; and
nano magnetic particles contained in the matrix.
2. The composite according to claim 1, wherein the nano magnetic particles are non-spherical.
3. The composite according to claim 2, including spherical nano magnetic particles in addition to the non-spherical nano magnetic particles.
4. The composite according to claim 1, wherein the nano magnetic particles are spherical.

5. The composite according to claim 1, wherein the matrix is selected from the group consisting of silica, alumina, and hydrosilsesquioxane.
6. The composite according to claim 1, wherein the matrix is selected from the group consisting of polyimide, PMMA, and methyl silsesquioxane.
7. The composite according to claim 1, wherein the nano magnetic particles are superparamagnetic.
8. The composite according to claim 7, including diamagnetic nano magnetic particles in addition to the superparamagnetic nano particles.
9. The composite according to claim 8, wherein the diamagnetic nano particles include indium (In).
10. The composite according to claim 1, wherein the nano magnetic particles are diamagnetic.
11. The composite according to claim 1, wherein the nano magnetic particles are selected from the group consisting of (γ -Fe₂O₃), chromium oxide (CrO₂), europium oxide (EuO), NiZn-ferrite, MnZn-ferrite, and yttrium-iron garnet.
12. The composite according to claim 2, wherein the nano magnetic particles include indium.

13. A semiconductor device comprising:

a semiconductor substrate; and

copyr. for — an insulator made of a composite having a dielectric matrix, and nano magnetic particles contained in the matrix.

14. The semiconductor device according to claim 13, wherein the nano magnetic particles are non-spherical.

15. The semiconductor device according to claim 13, wherein the nano magnetic particles are spherical.

16. The semiconductor device according to claim 13, wherein the nano magnetic particles are superparamagnetic.

17. The semiconductor device according to claim 15, wherein diamagnetic nano magnetic particles are added to the superparamagnetic nano particles.

18. An optical device comprising:

a transparent dielectric matrix; and

a composite having nano magnetic particles contained in the matrix.

19. The optical device according to claim 18, wherein the nano magnetic particles are non-spherical.

20. The optical device according to claim 18, wherein the nano magnetic particles are spherical.

21. A method for manufacturing a composite comprising:

forming nano magnetic particles; and

distributing the nano magnetic particles in a dielectric matrix.

22. The method according to claim 21, wherein forming nano magnetic particles includes mixing a cation surfactant with an anion surfactant of a metal salt to form a mixture and subjecting the mixture to chemical sedimentation to form non-spherical nano magnetic particles.